

APPENDIX A

Proposed Revisions to Lake Okeechobee Operational Guidance

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General Overview

The U.S. Army Corps of Engineers (USACE) is responsible for management of the water resources contained within Herbert Hoover Dike (HHD) and for the development of regulations for operation of Lake Okeechobee's outlet structures. Water management operations at Lake Okeechobee are performed to ensure that Congressionally-authorized project purposes are met. The Congressionally-authorized project purposes for Lake Okeechobee include: flood control; navigation; water supply for Everglades National Park (ENP), salinity control, regional groundwater control, agricultural irrigation, municipalities and industry; enhancement of fish and wildlife; and recreation.

The purpose of this operational guidance document is to describe and explain the implementation of the proposed water management operational changes to Lake Okeechobee and the Everglades Agricultural Area. These changes will be included in the revised Lake Okeechobee and Everglades Agricultural Area Water Control Plan (WCP). This proposed water management operational guidance pertains to the Lake Okeechobee Regulation Schedule (LORS) which defines allowable releases to the Water Conservation Areas (WCAs) and to tide (estuaries). The water management operational guidance pertaining to operations that are not prescribed by the regulation schedule and which are utilized in accordance with the current WCP (Lake Okeechobee and Everglades Agricultural Area, July 2000) will remain in effect and be incorporated into the revised WCP. The revised Lake Okeechobee and Everglades Agricultural Area WCP is currently scheduled to be approved for implementation after the Lake Okeechobee Regulation Schedule Study Supplemental Environmental Impact Statement (LORSS SEIS) process has been completed.

Lake Okeechobee Regulation Schedule

The regulation schedule is a tool used by water managers to meet Congressionally-authorized project purposes. A regulation schedule attempts to meet all functional objectives of the particular project, acting separately or in combination with other projects in a system. The regulation schedule has been, and will continue to be, designed to balance multiple, and often competing, project purposes and objectives. Managing for better performance of one objective often lessens the effectiveness of performance of competing objectives. For example, higher regulation schedules tend to benefit water supply, but may increase the risk to public health and safety, and can harm the ecology of the lake. Lower lake schedules may produce lake levels more desirable for the lake ecology and improved flood protection, but reduce water supply potential. Lower lake schedules may also harm the ecology of the lake during extended dry periods and downstream estuaries during extended wet periods. Therefore, the LORS is not developed to optimize performance of any single project purpose, but rather balances the performance of the multiple project purposes. The regulation schedule contains bands which vary with the time of year. Releases are outlined by flowcharts that define the allowable releases by structure within each band.

Though water supply is a project purpose, water supply release volumes are not prescribed by this regulation schedule. However, water supply releases are made to meet downstream

demands that can include agricultural irrigation, municipal and industrial needs, estuary and other environmental water supply needs.

Lake Okeechobee Regulation Schedule Study

The current Lake Okeechobee and Everglades Agricultural Area WCP includes the existing Lake Okeechobee interim regulation schedule (shown in Figure 1), commonly referred as “Water Supply and Environment (WSE) regulation schedule”, which has been in use since July 2000 (located at <http://www.saj.usace.army.mil/h2o/lib/documents/WSE/index.html>). LORSS was initiated to address high lake levels, high estuarine discharges, estuary ecosystem conditions, and lake ecology conditions that occurred during the 2003 to 2005 time period. The LORSS considered the back-to-back historically significant 2004 and 2005 hurricane seasons’ effects on the recognized structural integrity issues of HHD along with effects to other project purposes.

The LORSS resulted in the development of several alternative regulation schedules, including the Tentatively Selected Plan (TSP). The TSP is a completely new regulation schedule with new breakpoints for all bands, new release magnitudes in many bands, and new forecasting indices. Both WSE and the TSP are based on WSE’s Operational Guidance that includes: “Part 1: Define Lake Okeechobee Discharges to the WCAs” and “Part 2: Define Lake Okeechobee Discharges to Tidewater (Estuaries)”. Parts 1 and 2 of the WSE Decision Tree are shown on Figure 2 and Figure 3, respectively. The South Florida Water Management District (SFWMD) and USACE 1999 report; “The Lake Okeechobee WSE Operational Guidelines” located in the July 2000 LORS Environmental Impact Statement (EIS) defines and describes the development of WSE.

The Preferred Alternative was identified to be effective at decreasing the risk to public health and safety, reducing the number of high-volume discharges to the estuaries, and providing critical flexibility to perform water management operations. Selection of the TSP included analysis of South Florida Water Management Model (SFWMM also known as the 2x2) output. The SFWMM was used to simulate the performance of the alternative regulation schedules over a 36-year period of record, based on climate and hydrometeorologic data from 1965 to 2000.

Daily water management operational decisions will consider all conditions/data available and climatologic conditions during the 1965 to 2000 period which are representative of a wide range of historic conditions, but are not a predictor of future climatologic conditions. The new Lake Okeechobee/EAA WCP will need to contain flexibility to manage for high lake levels, including scenarios not experienced during the period of record. Water managers make decisions based on the best available information, given the uncertain nature of future events.

The TSP simulation resulted in a one-day average-daily peak lake elevation of 17.33 feet, National Geodetic Vertical Datum of 1929 (NGVD). High lake levels are of importance due to the known integrity issues with HHD and USACE’s responsibility to provide for public health and safety. In 1998, the combined probability for a breach at HHD, as shown in Table 1, was recognized as a concern by USACE. The probabilities in Table 1 assumed an unidentified and unaddressed integrity issue. USACE currently has both short-term as well as long-term solutions

addressing this concern. For additional information on HHD, please visit the USACE Jacksonville District webpage at: <http://www.saj.usace.army.mil/>

Table 1

Probability of HHD Breach at Selected Lake Elevations
From Table H-10.2, 1998 HHD Major Rehabilitation Report

Lake Elevation (ft., NGVD)	Combined Probability Of HHD Breach (%)
15	1
16	3
17	11
18	45
21	100

Summary of the Tentatively Selected Plan

The Preferred Alternative resulted in proposed water management operational guidance to be used on a daily basis in the management of Lake Okeechobee. The proposed operational guidance includes: 2007 Lake Okeechobee Interim Regulation Schedule Part A through D (Figures 4 through 7, respectively), Tributary Hydrologic Conditions (THCs), weather forecasts, climate-based hydrologic outlooks, and historical as well as projected lake level information.

Through the Preferred Alternative, management of Lake Okeechobee water levels and determination of Lake Okeechobee releases to the WCAs and to tide (estuaries) is based on seasonally varying lake elevations divided into three bands as shown on the proposed 2007 Lake Okeechobee Interim Regulation Schedule Part A (Figure 4). These bands include “High Lake Management” (top band on Figure 4), “Operational” (middle band on Figure 4), and “Water Shortage Management” (bottom band on Figure 4). The High Lake Management Band is meant to address public health and safety, especially related to the structural integrity of HHD by providing the ability to make releases up to the maximum capacity that lake outlets will allow. The Operational Band is meant to facilitate authorized project purposes by providing the ability to make releases of various volumes, including no release; Lake Okeechobee outlet canals should be maintained within their optimum water management elevations. The Water Shortage Management Band pertains to low lake levels which necessitate rationing water supplies; Lake Okeechobee outlet canals may be maintained below their optimum water management elevations. The water supply releases made within this band are made according to the SFWMD’s draft Lake Okeechobee Water Shortage Management Plan (LOWSM).

The 2007 Lake Okeechobee Interim Regulation Schedule Part B (Figure 5) further defines the bands of the regulation schedule. In Part B, the Operational Band is subdivided into additional bands and sub-bands that are directly related to defining allowable Lake Okeechobee releases to the WCAs and to tide (estuaries). In general as lake levels rise through the higher sub-bands, the allowable release rates increase.

Evaluation of the Preferred Alternative over the period of record (1965 to 2000) shows that the proposed regulation schedule releases to the WCAs and to the estuaries will reduce the likelihood of lake levels that both increase the probability of a breach of the HHD and also contribute to poor ecological conditions within Lake Okeechobee. For Lake Okeechobee, a high lake level can lead to the decline of emergent and submerged vegetation which is essential habitat for the lake's fish and wildlife populations.

The Preferred Alternative provides the ability to make long-term, low-volume releases to the Caloosahatchee Estuary, St. Lucie Estuary, and WCAs. These releases include low-volume pulse releases and base flow releases to the Caloosahatchee and St. Lucie estuaries that allow Lake Okeechobee to be maintained at more desirable levels throughout the year. A pulse release attempts to simulate a natural rainstorm event within the basins. The receiving body would respond to the pulse release in a similar fashion as if a rainstorm had occurred in the upstream watershed. Although an average flow rate is targeted for the duration of the pulse release, daily releases vary. The pulse releases and base flow releases are intended to regulate lake levels and reduce the potential for future prolonged high-volume releases to the estuaries. The base flow releases also provide a benefit of maintaining desirable salinity levels in the estuaries. By regulating lake levels, these low-volume releases improve public health and safety performance by reducing risk to the HHD and provide improved benefits for the health of Lake Okeechobee and the estuaries.

General Comparison of the Tentatively Selected Plan to Water Supply Environment

The TSP includes the Lake Okeechobee Management Bands and Sub-Bands shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part B (Figure 5), and the release guidance, Part C (Figure 6) and Part D (Figure 7). The differences between the Decision Trees for WSE and the TSP's 2007 Lake Okeechobee Interim Regulation Schedule Parts C and D are shown in blue on Figures 6 and 7. As with WSE, the Preferred Alternative utilizes climate-based hydrologic outlooks that may result in a release less than the maximum allowable within a given band when Lake Okeechobee is within the High, Intermediate, or Low Sub-Bands of the Operational Band. The use of hydrologic outlooks allows releases to be made that are commensurate with expected inflow conditions. For example, if the hydrologic outlook is relatively dry, then releases can be less than the maximum allowable within a given band.

The TSP's THC's shown in blue on Figures 6 and 7 have been improved to provide a more comprehensive representation of hydrologic conditions in the Lake Okeechobee watershed. THC's used with WSE only utilized average historical evapotranspiration and excluded rainfall over Lake Okeechobee. As proposed, the THC within Figures 6 and 7 now utilizes the Palmer Index from the National Weather Service and the calculated Lake Okeechobee Net Inflow (Table 2). The Palmer Index depends on temperature, rainfall and soil moisture data, and represents hydrologic conditions such as a drought, or an abnormal dry, or an abnormal wet state. The second THC is the Lake Okeechobee Net Inflow. Net Inflow is defined as rainfall minus evapotranspiration plus lake inflows. WSE used the S-65E inflow as a THC. The TSP's use of the Net Inflow THC accounts for all inflows to, and direct rainfall over Lake Okeechobee. The wettest of the two indicators describes the current tributary condition.

Similar to WSE, the TSP's release guidance (Part D, Figure 7) includes the use of weather forecasts and climate-based hydrologic outlooks as represented by the terms "Seasonal Climate Outlook", "Meteorological Forecast", and "Multi-Seasonal Climate Outlook." Meteorological forecasts are short-term (typically days to weeks) whereas climate outlooks are longer term (months to a year). The climate-based hydrologic outlook is known as the Lake Okeechobee Net Inflow Outlook (LONINO). The seasonal LONINO (six-month outlook) and multi-seasonal LONINO (up to 12-month outlook) are based on historical net inflow data and climate outlooks provided by National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center (CPC). The use of these forecasts and outlooks will continue with the implementation of the TSP.

The WSE Decision Tree did not consider actual lake level rise or an anticipated or projected lake level. As proposed, Figure 7 now includes "Lake level projected to rise to" in the High and Intermediate Sub-Bands of the Operational Band to allow quicker implementation of lake releases to slow projected rapid rates-of-rise.

As was the practice for WSE, the TSP includes continuous releases at various volumes, including pulse releases. In a similar manner as WSE, actual releases to be implemented may be performed in a pulse release to simulate natural hydrologic conditions, such as a rainfall event.

The TSP references pulse releases to the Caloosahatchee Estuary at S-79; WSE referenced pulse releases at Lake Okeechobee through S-77. By referencing pulse releases at S-79, local basin runoff is considered when determining the necessary supplemental release at S-77. This achieves pulse releases that are more sensitive to the estuary. This new operation is also consistent with the current pulse release operation to the St. Lucie Estuary at S-80.

Unlike WSE, the TSP provides a base flow release to the estuaries; up to 450 cubic feet per second (cfs) can be made at S-79 and up to 200 cfs can be made at S-80. These base flow releases also consider basin runoff and Lake Okeechobee releases can be made when basin runoff is less than the base flow target. Base flow releases are intended to regulate lake levels and reduce the potential for future prolonged high-volume releases to the estuaries. The base flow releases also provide a benefit of maintaining desirable salinity levels in the estuaries.

Proposed Operational Guidance

The Operational Guidance establishes the allowable quantity, timing, and duration of releases from Lake Okeechobee to the WCAs and to tide (estuaries). Water management decisions will utilize the 2007 Lake Okeechobee Interim Regulation Schedule Parts A through D (Figures 4 through 7) to provide guidance on releases from Lake Okeechobee. Information shown on Part C and Part D (Figures 6 and 7) is utilized to establish the allowable releases to the WCAs and the allowable releases to tide (estuaries), respectively.

In January 2007, the SFWMD Governing Board passed a resolution requesting the Corps to take into consideration increased storage capacity on SFWMD public and private lands in the Okeechobee Watershed to receive Lake Okeechobee water releases. A copy of the SFWMD resolution and past correspondence is provided in Appendix H. The SFWMD lands for storage,

as described in the resolution, would be utilized to achieve a more refined balance between the competing needs of Lake Okeechobee and estuarine ecosystems, flood control and water supply. The Corps strongly supports this state initiative and continues to work with SFWMD to utilize their public/private lands for Lake Okeechobee water storage in conjunction with operation of the Preferred Alternative. When the Operational Guidance and/or basin conditions between Lake Okeechobee and the estuaries result in flows deemed undesirable by SFWMD to the estuaries, the SFWMD may seek to store Lake Okeechobee water on available SFWMD designated lands. As Comprehensive Everglades Restoration Plan (CERP) reservoirs designed to receive Lake Okeechobee releases become available, they will be operated according to the operational guidance established for those projects. These efforts are intended to reduce undesirable lake releases to the estuaries by first making lake releases to alternative storage areas to minimize flows that are above the estuary's biologically-derived maximum flow criteria.

The "Lake level projected to rise to" phrase in the Lake Okeechobee Operational Guidance to Tide (Figure 7) can be determined on a daily basis. Information to be considered includes, but is not necessarily limited to, the following variables: climate forecasts, release constraints due to downstream conditions, actual lake level rate of rise, historical lake levels, and the state of the Central and Southern Florida (C&SF) Project (including the availability of new facilities proposed by the CERP).

Lake Okeechobee Management Bands

The proposed operational guidance for management of the Lake Okeechobee water levels and outlet canals has three distinct bands defined by seasonal fluctuations of the lake level (Figure 4). Each management band is designed to achieve specific objectives consistent with Congressionally-authorized purposes for Lake Okeechobee. The bottom band, at the lower lake levels, is the Water Shortage Management Band. In this band, water in Lake Okeechobee will be managed in accordance with the Water Shortage Plan established by SFWMD. Outlet canals may be maintained below their optimum water management elevations in this band. The top band, at the higher lake levels, is the High Lake Management Band. The goal for lake management within this band is to quickly lower high lake levels. This will make lake storage available for use during the next rainfall event, to reduce impacts on Lake Okeechobee's submerged aquatic vegetation and to reduce the risk to public health and safety, including but not limited to HHD integrity issues; outlet canals may be maintained above their optimum water management elevations in this band. The middle and largest band is the Operational Band, which includes several sub-bands (High, Intermediate, Low, Base Flow, and Beneficial Use Sub-Bands). It is anticipated that the majority of time, lake levels will be within the Operational Band, and Lake Okeechobee would be managed according to the operational criteria established for the sub-bands of the Operational Band, including provisions to meet water supply demands (for ENP, salinity control, regional groundwater control, agricultural irrigation, municipalities, and industry). Outlet canals should be maintained within their optimum water management elevations in this band.

Within the High, Intermediate, Low, and Base Flow Sub-Bands, the allowable release from Lake Okeechobee to the WCAs is defined by lake level, hydrologic conditions, effect of desired release on the Everglades, treatment capacity of Storm Water Treatment Areas (STAs), and

downstream WCA level(s), as well as long-term climate-based hydrologic outlooks (Figure 6). Also within the Operational Band and its sub-bands, the allowable release from Lake Okeechobee to the estuaries is defined by lake level, the trend of the lake level, hydrologic conditions, short-term weather forecasts, and long-term climate-based hydrologic outlooks (Figure 7). A detailed description of the management bands follows.

Water Shortage Management Band—varies seasonally between 9.7 to 13.0 ft., NGVD and below. Operations in this band are governed by the SFWMD's LOWSM (**NOTE: draft Water Shortage Management Band elevations may change upon completion of SFWMD's rule making process.**). The goal of this band is to manage existing water supply contained within Lake Okeechobee in accordance with SFWMD rules and guidance.

High Lake Management Band—varies seasonally between elevations 16.0 and 17.25 ft., NGVD and above. The goal of this band is to reduce the risk to public health and safety and to make releases to lower the lake below the High Lake Management Band as soon as possible. In this High Lake Management Band, it is of the utmost importance that the lake level be reduced as rapidly as possible to make storage available for the next possible rainfall event, to relieve stress on the HHD, and to reduce impacts on Lake Okeechobee's littoral zone. Releases up to the maximum discharge capacity will be made to tide and up to maximum practicable discharges will be pumped to the WCAs and made available to CERP impoundments (as they become available). In an effort to reduce undesirable lake releases to the estuaries, Lake Okeechobee water will also be made available to the SFWMD for their use to store on lands designated by SFWMD (as they become available). Within the High Lake Management Band, the allowable release from Lake Okeechobee to the WCAs and to the estuaries is defined by the lake level as shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part C and Part D (Figures 6 and 7), respectively. Actual rates of release from Lake Okeechobee will vary depending on but not limited to downstream channel conditions, estuary conditions, conditions in the WCAs, and conditions in the STAs. Although unlikely to be required due to wet conditions that are likely to exist when lake levels are within this band, Lake Okeechobee releases to meet water supply demands (for ENP, salinity control, regional groundwater control, agricultural irrigation, municipalities, industry, and the environment) may be made at any time within the High Lake Management Band.

Operational Band—the largest management band varies seasonally between 9.7 ft. at its lowest point and 17.25 ft., NGVD at its highest point. (**NOTE: draft Water Shortage Management Band elevations may change upon completion of SFWMD's rule making process which would raise the bottom of the Operational Band-9.7 ft.**). The goal of the Operational Band is to manage the lake stage to balance all authorized project purposes. This involves use of flood control releases, environmental releases, base flow releases, and water supply releases. In an effort to reduce undesirable lake releases to the estuaries, Lake Okeechobee water may be stored in CERP reservoirs (as they become available) or SFWMD may seek to store Lake Okeechobee water on available SFWMD designated lands. The USACE will coordinate operations with the SFWMD as necessary. For Lake Okeechobee, an environmental release can be considered as a release from Lake Okeechobee to benefit the lake ecosystem, downstream ecosystems, and/or upstream ecosystems. For Lake Okeechobee, a base flow release to the Caloosahatchee Estuary is a release from Lake Okeechobee at S-77 to achieve a 450 cfs flow at S-79. A base flow

release to the St. Lucie Estuary is a release at S-308 to achieve a 200 cfs flow at S-80. When conducting base flow releases, flows up to 650 cfs can be distributed East and West as needed to minimize impacts or provide additional benefits. Very dry THCs may require that releases to tide (estuaries) be discontinued. For Lake Okeechobee, a water supply release can be considered a release from Lake Okeechobee to meet water supply demands (for ENP, salinity control, regional groundwater control, agricultural irrigation, municipalities, industry and the environment). Lake Okeechobee releases to meet water supply demands may be made at any time within the Operational Band. Within the Operational Band, several sub-bands have been established to further define lake releases. As described below, these bands include the Beneficial Use Sub-Band, Base Flow Sub-Band, Low Sub-Band, Intermediate Sub-Band, and High Sub-Band.

Beneficial Use Sub-Band: This sub-band varies seasonally between elevation 9.7 ft. and 13.0 ft., NGVD at its highest point. **(NOTE: draft Water Shortage Management Band elevations may change upon completion of SFWMD's rule making process which would raise the bottom of the Beneficial Use Sub-Band-9.7 ft.).** Except for navigation, SFWMD allocates water to various users in this sub-band. Navigation can typically be supported by releases from Lake Okeechobee that are conducted for other authorized project purposes. Fish and wildlife enhancement and/or water supply deliveries for environmental needs may involve conducting an environmental release from Lake Okeechobee through the SFWMD's "Adaptive Protocols" or other SFWMD authorities.

Base Flow Sub-Band: This sub-band varies seasonally between elevation 12.6 ft. and 14.5 ft., NGVD. In this band, the allowable release from Lake Okeechobee to the WCAs is defined by lake level, hydrologic conditions, effect of desired release on the Everglades, treatment capacity of STAs, downstream WCA level(s), THCs, and climate-based hydrologic outlooks as shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part D (Figure 7). Also in this sub-band, continuous, low-volume releases can be made to the Caloosahatchee Estuary and the St. Lucie Estuary. Base flow limits are defined as up to 450 cfs measured at S-79, and up to 200 cfs measured at S-80. If the basin runoff between Lake Okeechobee and the estuary is less than this "base flow", then Lake Okeechobee releases are made to supplement the difference. These base flow releases of excess lake water may have environmental benefits to the estuaries and help to reduce the chances of subsequent high volume discharges. In addition, the SFWMD may allocate water to the environment through its "Adaptive Protocols" or other SFWMD authorities.

Low Sub-Band: This sub-band varies seasonally between elevation 13.0 ft. and 16.25 ft., NGVD. In this sub-band, operations for releases to the WCAs and base flow to the estuaries will be conducted consistent with the Base Flow Sub-Band. Lake Okeechobee releases to the estuaries that are greater than base flow are allowed within this sub-band and are defined by lake level, hydrologic conditions, lake level's distance from the Intermediate Sub-Band, THCs, and climate-based hydrologic outlooks as shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part D (Figure 7). As shown on Part B, this sub-band was divided into thirds (Upper Range, Middle Range, Lower Range). Within the Upper Range, the pulse release to the Caloosahatchee Estuary is up to 3000 cfs while to the St. Lucie Estuary it is up to 1170 cfs (3000/1170). The pulse release in the Middle Range and the Lower Range is 2500/950 and 2000/730, respectively. Within the Low Sub-Band, the release from Lake Okeechobee to the

WCAs is defined by lake level, THC's, effect of desired release on the Everglades, downstream WCA level(s), and the multi-seasonal climate-based hydrologic outlook as shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part C (Figure 6). The maximum allowable lake releases to the WCAs and estuaries is provided as follows:

- (1) To WCAs-When THC's and the multi-seasonal climate/hydrologic outlook are not in their dry classifications, then up to maximum practicable release to the WCAs are allowable if the release is beneficial to, or will result in minimum Everglades impacts. Both the quantity and quality of Lake Okeechobee water will be considered.
- (2) To Estuaries-When tributary conditions are very wet, the lake level is within one foot of the Intermediate Sub-Band, and the seasonal climate forecast is very wet, then lake releases up to 4000 cfs at S-77 and up to 1800 cfs at S-80 (4000/1800) are allowable.
- (3) To Estuaries-When the lake level is not within one foot of the Intermediate Sub-Band, or tributary conditions are not very wet, and the multi-seasonal climate/hydrologic outlook is wet, then lake releases up to 3000 cfs at S-79 and up to 1170 cfs at S-80 (3000/1170) are allowable. These releases are intended to be made in a pulse release that is sensitive to the estuarine environment.

Intermediate Sub-Band: This sub-band varies seasonally between elevation 15.0 ft. to elevation 16.88 ft., NGVD. In this sub-band, operations for base flow to the estuaries will be conducted consistent with the Base Flow Sub-Band. Lake Okeechobee releases to the estuaries that are greater than base flow are allowed within this sub-band and are defined by lake level, THC's, the projected rise of Lake Okeechobee, short term meteorological forecasts, seasonal hydrologic outlooks, and climate-based hydrologic outlooks as shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part D (Figure 7). The allowable release from Lake Okeechobee to the WCAs is defined by lake level and downstream WCA level(s), as shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part C (Figure 6). The maximum allowable lake releases to the WCAs and estuaries is provided as follows:

- (1) To WCAs-When all downstream WCAs are less than a quarter of a foot above the maximum elevation of their regulation schedules, then up to maximum practicable release to the WCAs are allowable. Downstream WCAs refer to the WCAs downstream of the WCA receiving Lake Okeechobee discharges. For example, if it is desired to make a release to WCA-3A (via STA-3/4), then WCA-1 and WCA-2A water levels do not constrain the release to WCA-3A since they are upstream of WCA-3A. However, if it is desired to make a release to WCA-2A (via STA-3/4), and if the WCA-3A water level was higher than a quarter of a foot above the maximum of its regulation schedule, then no release to WCA-2A would be made.
- (2) To Estuaries-When tributary conditions are very wet and the lake level is projected to rise into the High Sub-Band, lake releases up to 6500 cfs at S-77 and up to 2800 cfs at S-80 (6500/2800) are allowable.

High Sub-Band: This sub-band varies seasonally between elevation 15.5 ft. at its lowest point and elevation 17.25 ft., NGVD. In this sub-band, releases to the Caloosahatchee Estuary of up to 3000 cfs measured at S-79, and up to 1170 cfs to the St. Lucie Estuary measured at S-80, can always be made for management of the lake level. The allowable lake releases to the estuaries

are defined by lake level, THCs, the projected rise of the lake, short term weather forecasts, and the seasonal climate/hydrologic outlook as shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part D (Figure 7). The allowable release from Lake Okeechobee to the WCAs is defined by lake level and downstream WCA level(s), as shown on the 2007 Lake Okeechobee Interim Regulation Schedule Part C (Figure 6). The maximum allowable lake releases to the WCAs and estuaries is provided as follows:

- (1) To WCAs-When all downstream WCAs are less than a quarter of a foot above the maximum elevation of their regulation schedules, then up to maximum practicable release to the WCAs are allowable.
- (2) To Estuaries-When THCs are very wet and the lake level is projected to rise into the High Lake Management Band, then lake releases up to maximum discharge capacity are allowable.

Make-up Release Description

Historically, the planned Lake Okeechobee releases to tide (estuaries) have been subject to reduction or prevention by downstream conditions such as downstream local basin runoff, the tidal cycle, tidal storm surge, and spawning in the estuaries. Similarly, planned Lake Okeechobee releases to the WCAs have also been limited by high water levels in the WCAs, STA treatment capacity limits, and limited or no conveyance capacity in the primary canals within the Everglades Agricultural Area. When these conditions have occurred in the past, the releases have been delayed or discontinued to prevent adverse effects downstream from Lake Okeechobee. To address this issue, proposed operational guidance includes conducting releases from Lake Okeechobee to tide and/or to the WCAs (via STAs) to make up releases that were previously reduced or prevented. These make-up releases from Lake Okeechobee to tide (estuaries) and WCAs will occur as soon as possible and may occur when Parts C and D (Figures 6 and 7) do not allow releases or prescribe a lower volume release. The lake make-up releases to tide (estuaries) would be limited to a pulse release from Lake Okeechobee not to exceed 2800 cfs measured at S-79, and 2000 cfs at the St. Lucie Estuary when the lake level is below the Intermediate Sub-Band. This 2000 cfs at the St Lucie Estuary includes releases from all C&SF Project structures that discharge into the St Lucie Estuary.

If an evaluation leads to implementation of a make up release, the make up release volume will be equal to or less than the volume of water that was reduced or prevented. The make up releases would essentially allow the ability to postpone Lake Okeechobee releases. The make up release may or may not be implemented, conditions will be monitored to determine the need to implement.

Decision-Making Process

The decision-making process for Lake Okeechobee water management operations considers all Congressionally-authorized project purposes. The decision-making process to determine quantity, timing, and duration of the potential release from Lake Okeechobee includes consideration of various information related to water management. This information includes

but is not necessarily limited to: C&SF Project conditions, historical lake levels, estuary conditions/needs, lake ecology conditions/needs, WCA water levels, STA available capacity, current climate conditions, climate forecasts, hydrologic outlooks, projected lake level rise/recession, and water supply conditions/needs.

Part A of the 2007 Lake Okeechobee Interim Regulation Schedule (Figure 4) can be considered a starting point in the decision-making process for Lake Okeechobee water management operations. Part A allows a quick visual determination of which of the general management bands applies to the current lake stage.

Use of the 2007 Lake Okeechobee Interim Regulation Schedule Parts B through D (Figures 5 through 7) will result in the determination of releases from Lake Okeechobee. The elevation guidelines include appropriate variations by season to conform to competing project purposes. As with WSE, recreation and navigation is provided for when water is available and/or through releases conducted for other project purposes.

The release to be implemented will be limited to the allowable release determined from Part C and Part D (Figures 6 and 7), except as noted in the Make-up Release Description. Releases can vary up to the allowable release based on consideration of current and anticipated conditions/needs stated in the first paragraph of this section. This process allows for the quantity, timing, and duration of the releases to be performed to address the competing needs associated with water resources and the Congressionally-authorized project purposes.

When operating near band and sub-band limits, up to 30-day forecasts will be made and releases will be scheduled to lower or maintain Lake Okeechobee at the desired level during the 30-day period. Scheduling of releases may include the adjustment of band/sub-band limits when determining the release to implement. Factors considered in adjusting the band/sub-band limits would include but not be limited to: availability of STA treatment capacity, SFWMD designated lands, CERP reservoirs, and the condition of tributary basins. The band/sub-band adjustment is meant to transition into and out of sub-bands by allowing flows to gradually increase or decrease between sub-bands. An example of this adjustment would be: a condition above is occurring, lake level is 0.2 feet below the Intermediate Sub-Band and projected to rise into the Intermediate Sub-Band, then the allowable Lake Okeechobee release would be determined by following Part D with the lake level considered to be in the Intermediate Sub-Band (not 0.2 feet below the Intermediate Sub-Band).

Additional Operational Flexibility

It is anticipated that future events similar to those experienced over the period of record (1965-2000) will be effectively managed by the TSP. The TSP was also simulated for the 2001 through 2005 period, and deemed effective for managing high lake elevations under this set of conditions. Occasionally, additional operational flexibility will be used to address circumstances (i.e., hydrologic conditions, lake levels, spawning in the estuaries and downstream runoff) that were not evaluated in the TSP for the period of record. Additional operational flexibility provides water managers the ability to consider releases from Lake Okeechobee to the WCAs and to tide (estuaries) to minimize damages or to meet project purposes when the 2007 Lake

Okeechobee Interim Regulation Schedule Parts A through D (Figures 4 through 7) are not effective at managing lake levels consistent with the intent of the TSP.

Release decisions will take into account the estuary's biologically-derived maximum flow, future water supply demands, C&SF Project system-wide conditions, and lake ecological conditions, as appropriate. Consideration of the concern for public health and safety is the USACE's highest priority. Once implemented, releases will be discontinued when the conditions that prompted them have ceased or the desired outcome is achieved. Based upon the evaluation of historical conditions and the expected performance of the TSP, it is anticipated that use of additional operational flexibility will be infrequent.

Each event to be addressed by additional operational flexibility is unique and releases to be implemented will be defined by a desired outcome or time-period. The public will be notified of the planned releases, desired outcome, and implementation time period by the USACE's normal water management notification process (press release, internet webpage). The following sections identify the scenarios that would trigger the use of additional operational flexibility and provide details on releases to be considered under each scenario.

Additional operational flexibility will be used to address circumstances which were not evaluated in the TSP period of record, such as the following:

a. Undesirable/Prolonged High Lake Levels

Releases may be considered to prevent anticipated high lake levels or to lower high lake levels, in order to reduce risk to the HHD and to prevent additional adverse environmental impacts to Lake Okeechobee. In 2003, continuous high lake levels (above 15 ft., NGVD in excess of 13 months) resulted in a Temporary Deviation. The purpose of this Temporary Deviation was to minimize the risk of high lake levels, to lower Lake Okeechobee for prevention of additional adverse impacts in the lake and to reduce the potential of high-volume continuous releases to the estuaries. These intended purposes were accomplished while balancing other management objectives of water supply and flood control.

In the event that there are ongoing or planned activities at C&SF Project features (including CERP Projects) upstream or downstream of Lake Okeechobee, and high lake levels are projected to occur or anticipated to occur as a result of these activities and based on any combination of planned water management operations, climate forecasts, and historical information/data, then additional releases to the WCAs and to tide (estuaries) could be considered. All project purposes will be considered. When possible, the lake releases to tide (estuaries) would be limited to a pulse release from Lake Okeechobee not to exceed 2800 cfs measured at S-79 and 2000 cfs measured at the St. Lucie Estuary. This includes releases from all C&SF Project structures that discharge into the St Lucie Estuary. Releases to the WCAs would depend on available treatment capacity in the STAs and the water levels in the WCAs.

Additional releases might be implemented to lower Lake Okeechobee's level in advance of planned activities and/or to prevent high lake levels. An example is a planned muck removal

operation involving a lake drawdown in the Kissimmee River Basin that could result in the need to create storage in Lake Okeechobee prior to the planned Kissimmee River Basin drawdown.

b. Climate Conditions

In the event that climate conditions including but not limited to, El Nino, La Nina, and/or active hurricane season forecasts are projected to create or continue high lake levels, additional operational flexibility would allow releases to WCAs and to tide (estuaries) to be implemented. The lake releases to tide (estuaries) should be limited to a pulse release from Lake Okeechobee not to exceed 2800 cfs measured at S-79 and 2000 cfs measured at the St. Lucie Estuary. This includes releases from all C&SF Project structures that discharge into the St Lucie Estuary. The wet spring of 2004 (normally the dry season) and an overly active hurricane season are examples of conditions that could be addressed with additional operational flexibility.

c. Low Volume Releases

In the event that the lake level is above the Water Shortage Management Band and conditions exist that would require low-volume releases, additional operational flexibility would allow low-volume releases to be implemented. The low-volume releases would be implemented to address conditions including, but not limited to the following: to prevent and/or to lower high lake levels, to address algal blooms, to disperse saltwater in the river and/or estuary, or improve other conditions related to the Congressionally-authorized project purposes. The proposed low-volume releases would be limited to a pulse release from Lake Okeechobee of up to 2000 cfs measured at S-79 and up to 730 cfs measured at S-80.

As an example, a Low Volume Release operation occurred in 2004. Operations were conducted that included a pulse release that averaged up to 1600 cfs to the Caloosahatchee Estuary and up to 730 cfs measured at S-80. The purpose of these operations was to minimize the risk of high lake levels, to lower Lake Okeechobee for prevention of additional adverse impacts in the lake and to reduce the potential of high constant releases to the estuaries. These intended purposes were accomplished while balancing other management objectives of water supply and flood control.

Lake Okeechobee Regulation Schedule Study (LORSS)

Figures/Tables

08 February 2007

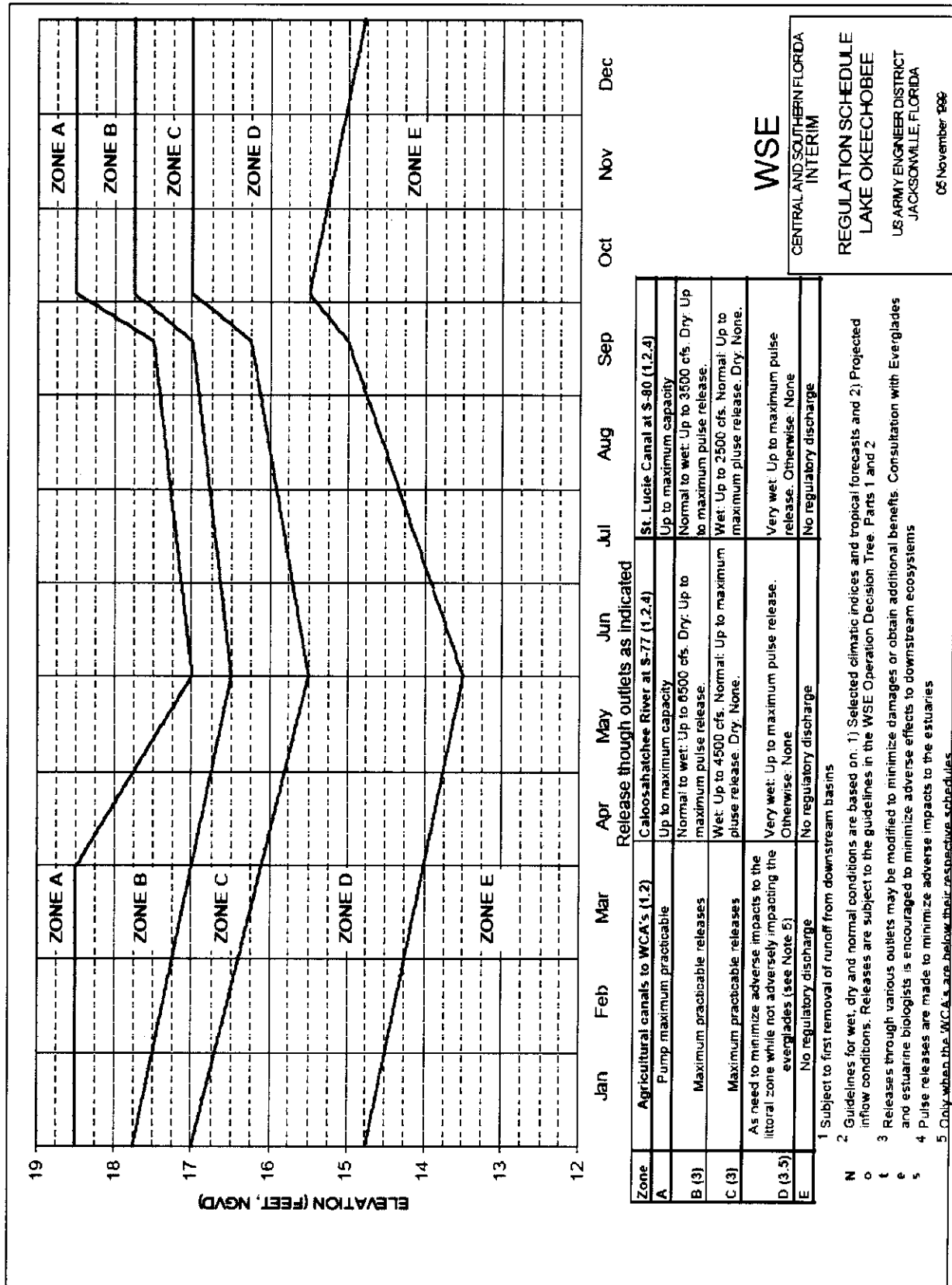


Figure 1

WSE Operational Guidelines Decision Tree

Part 1: Define Lake Okeechobee Discharges to the Water Conservation Areas

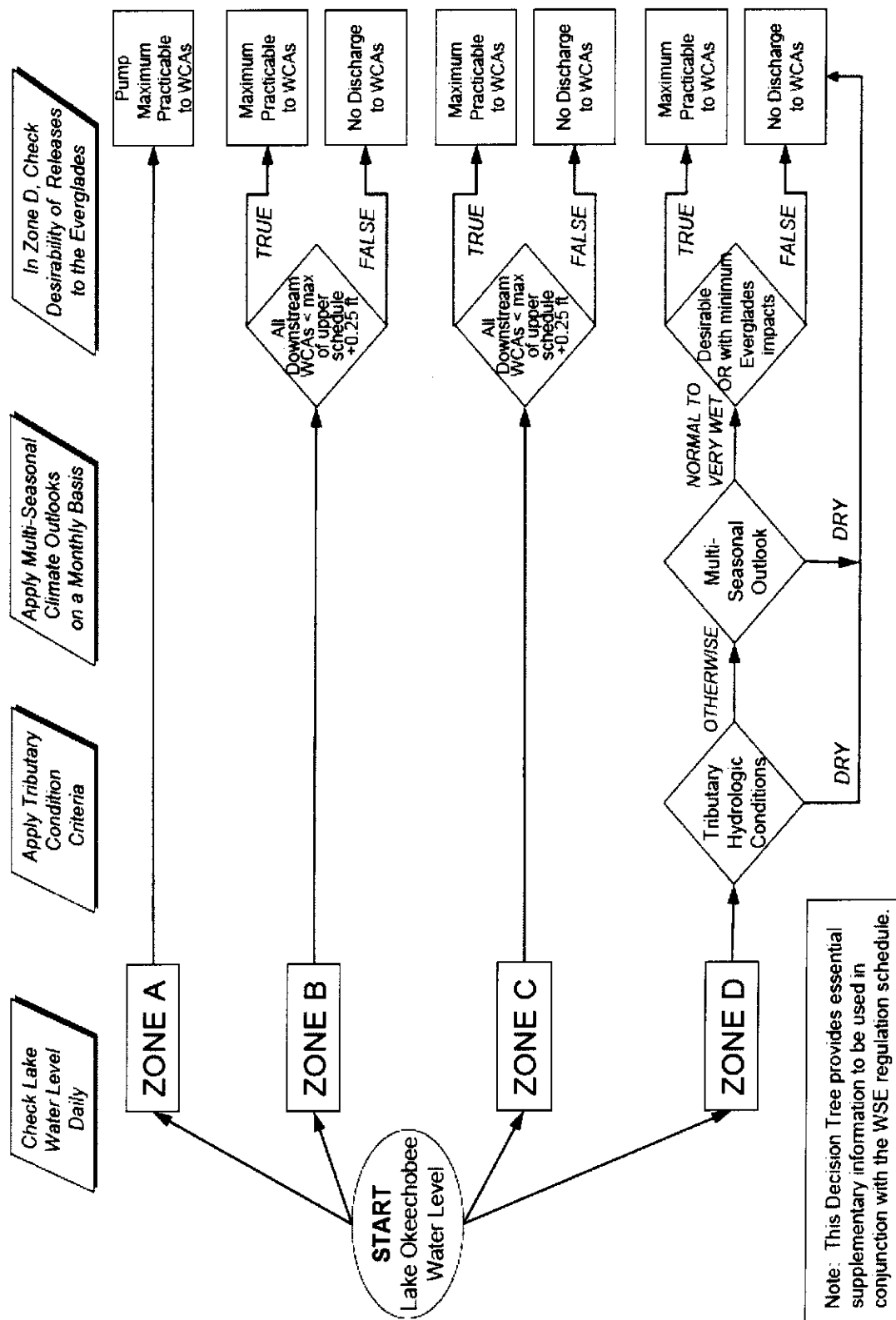


Figure 2

WSE Operational Guidelines Decision Tree

Part 2: Define Lake Okeechobee Discharges to Tidewater (Estuaries)

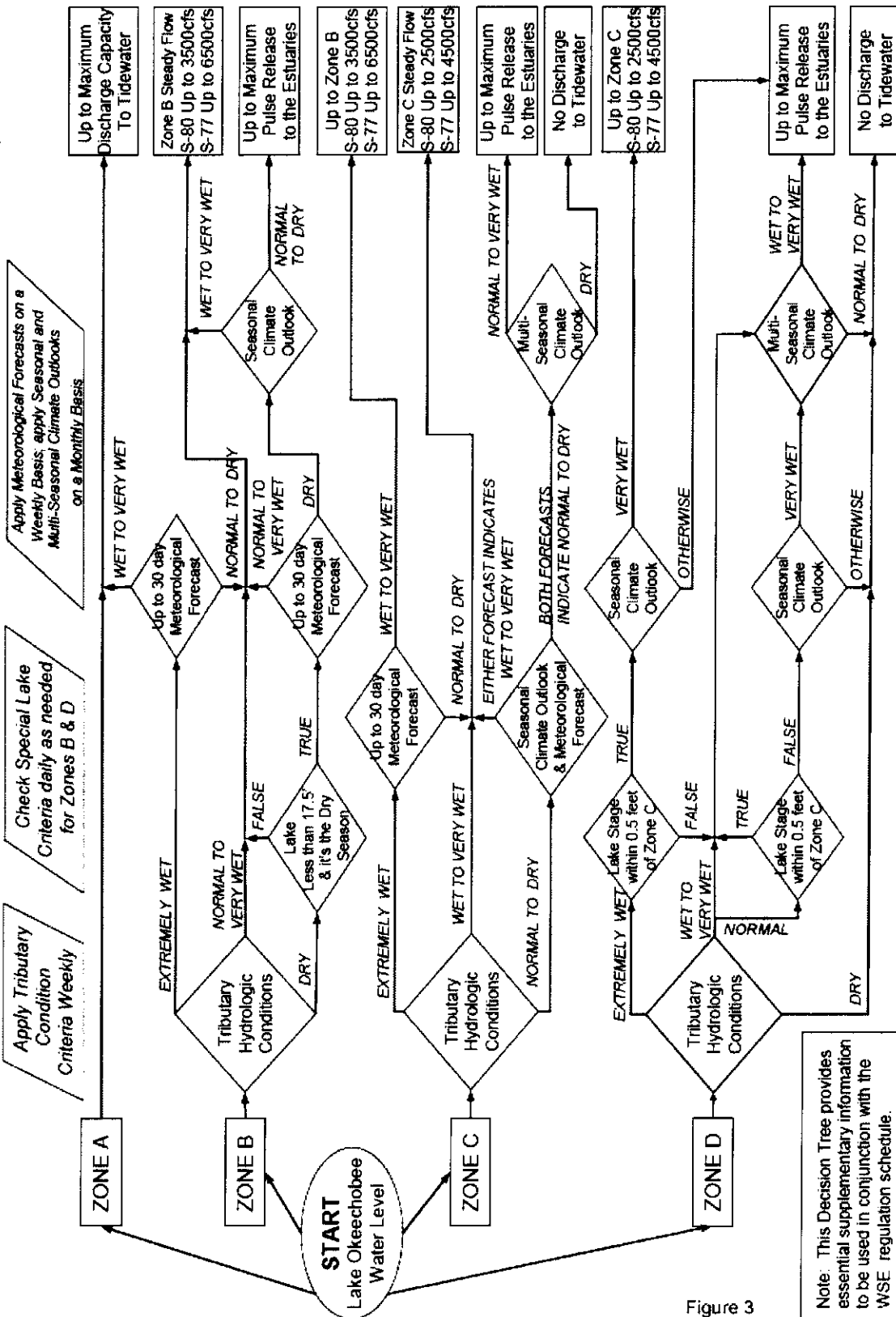
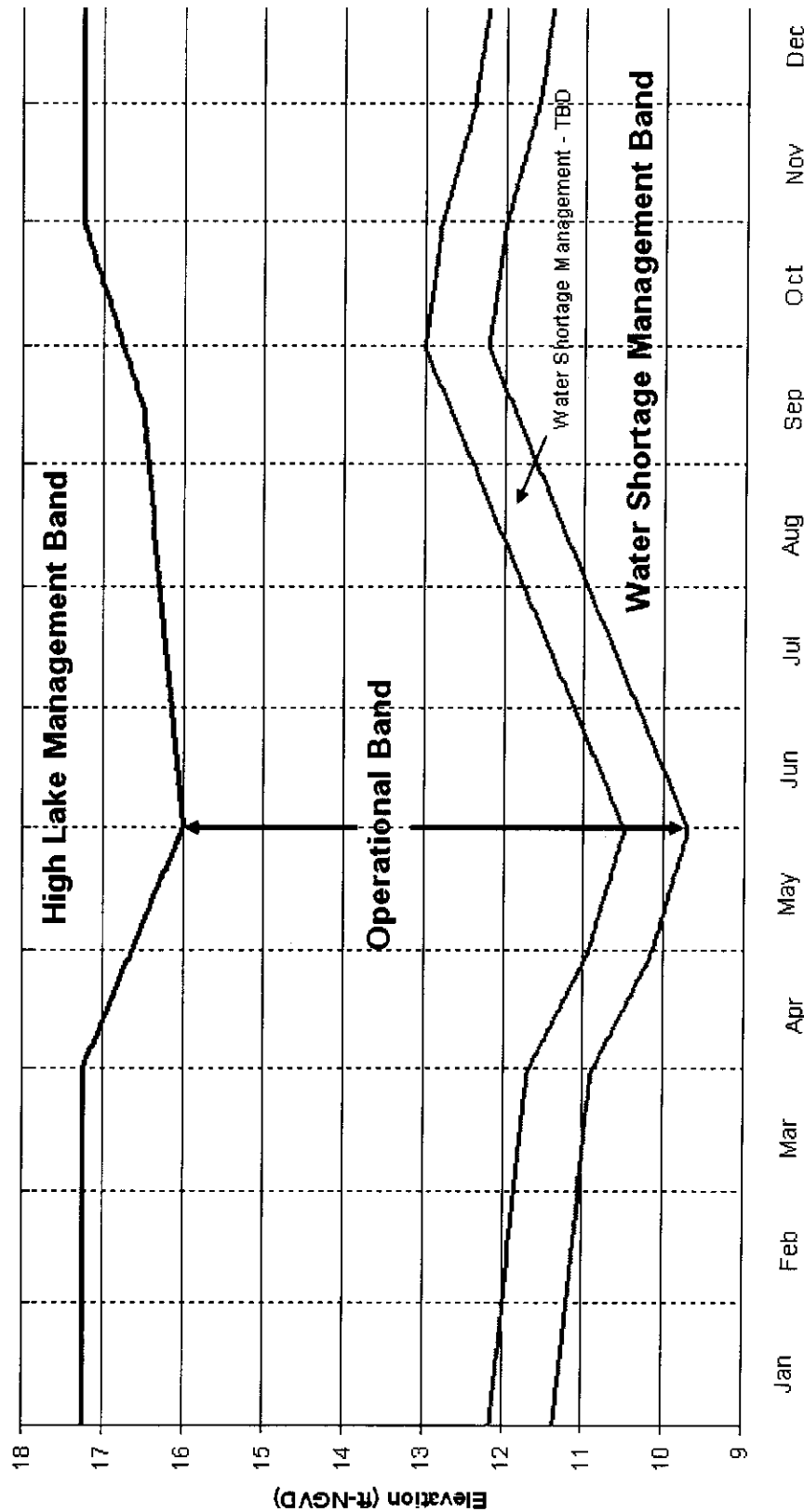


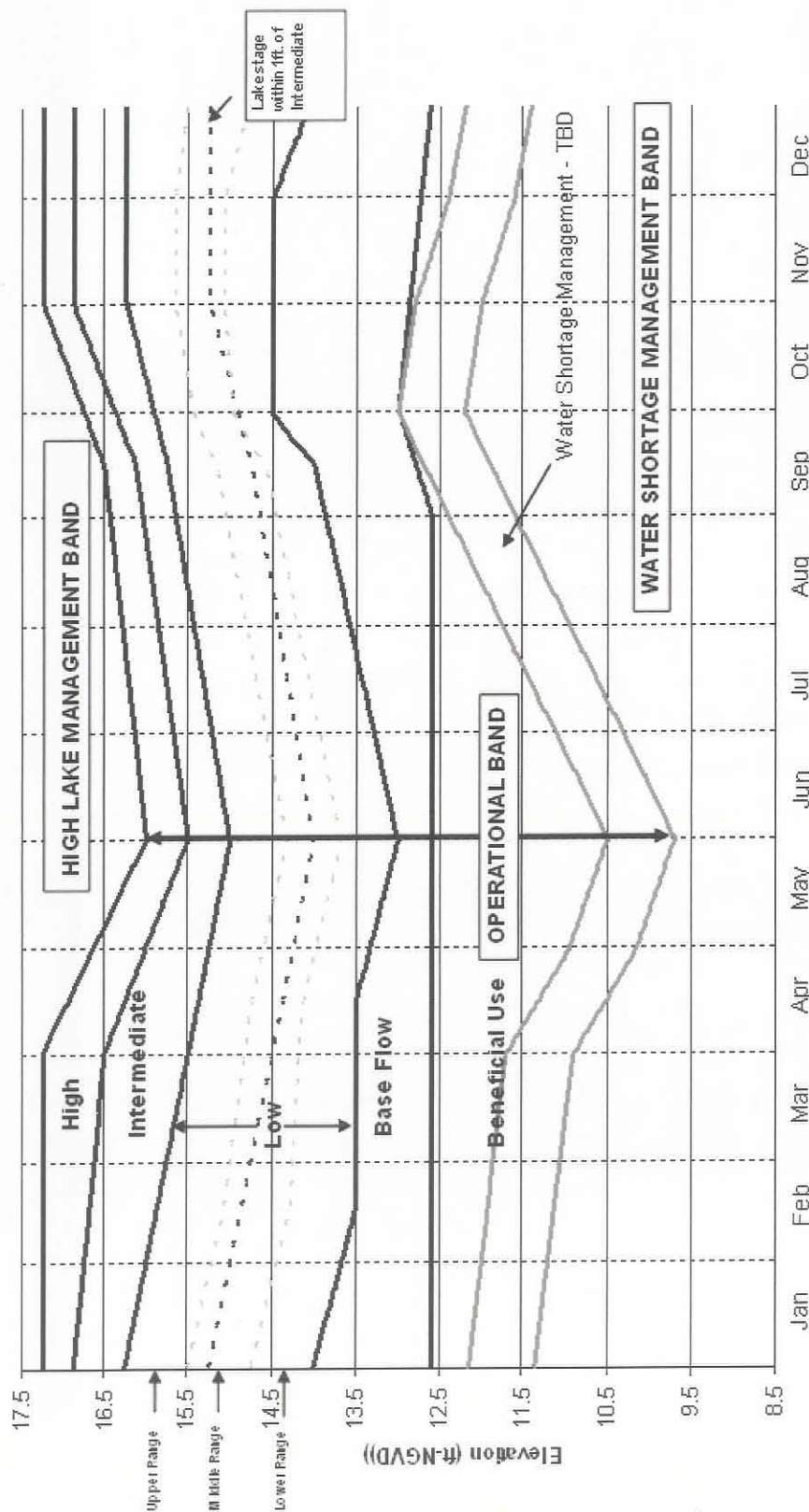
Figure 3



CENTRAL AND SOUTHERN FLORIDA PROJECT
INTERIM
LAKE OKEECHOBEE AND EVERGLADES AGRICULTURAL
AREA
Draft
**2007 LAKE OKEECHOBEE
REGULATION SCHEDULE
PART A**
DATED: 24 Oct 2007
DEPARTMENT OF THE ARMY, JACKSONVILLE DISTRICT

High Lake Management Band: Outlet Canals may be maintained above their optimum water management elevations.
Operational Band: Outlet Canals should be maintained within their optimum water management elevations.
Water Shortage Management Band: Outlet Canals may be maintained below optimum water management elevations. The band elevations may change upon completion of South Florida Water Management District's rule making process.

Figure 4



CENTRAL AND SOUTHERN FLORIDA PROJECT
 INTERIM
 LAKE OKEECHOBEE AND EVERGLADES AGRICULTURAL AREA
 Draft
2007 LAKE OKEECHOBEE REGULATION SCHEDULE
 PART B
 DATED: 24 Oct 2007
 DEPARTMENT OF THE ARMY, JACKSONVILLE DISTRICT
 CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

Figure 5

Lake Okeechobee Operational Guidance

Part C: Establish Allowable Lake Okeechobee Releases to the Water Conservation Areas

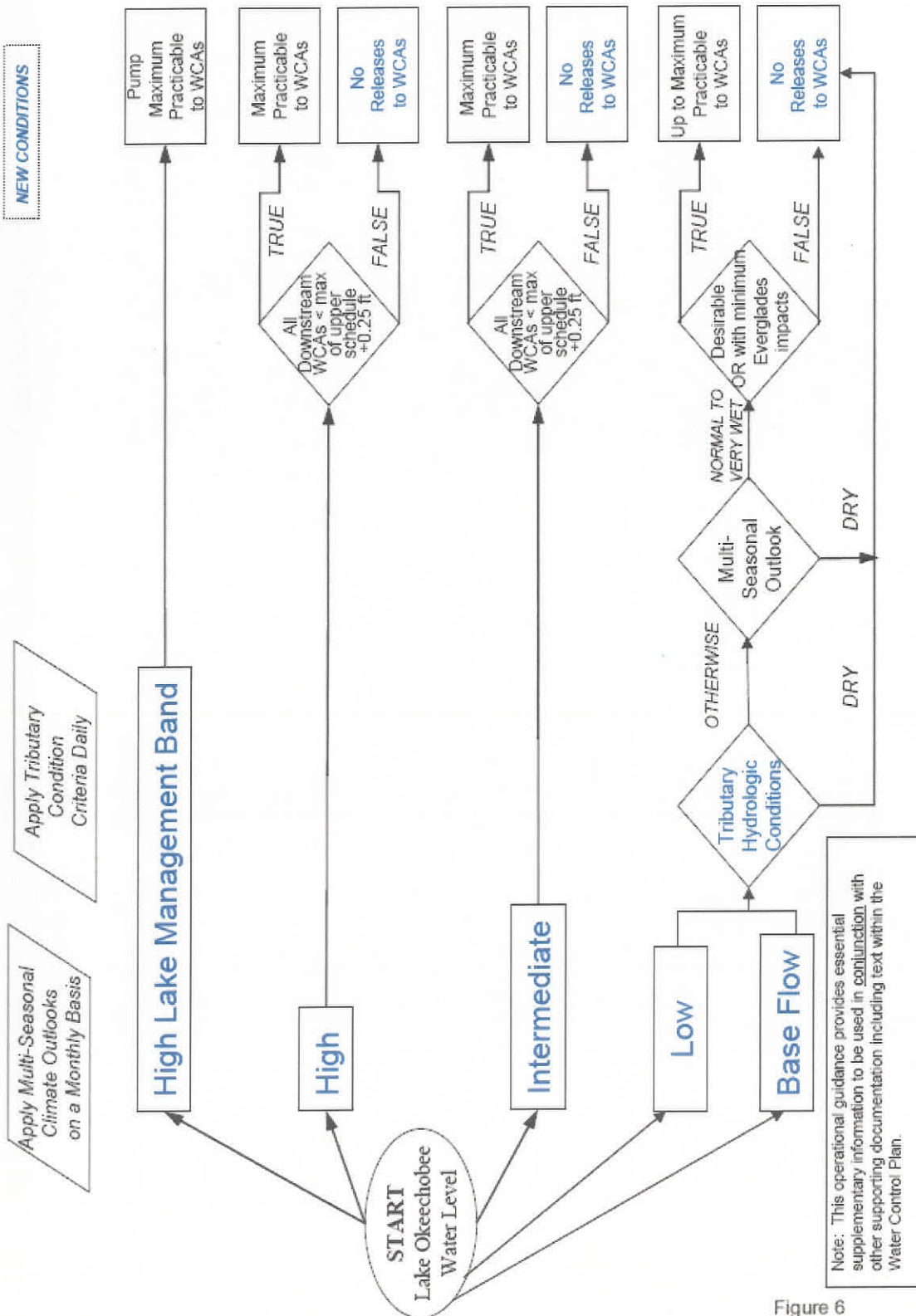


Figure 6

Part D: Establish Allowable Lake Okeechobee Releases to Tide (Estuaries)

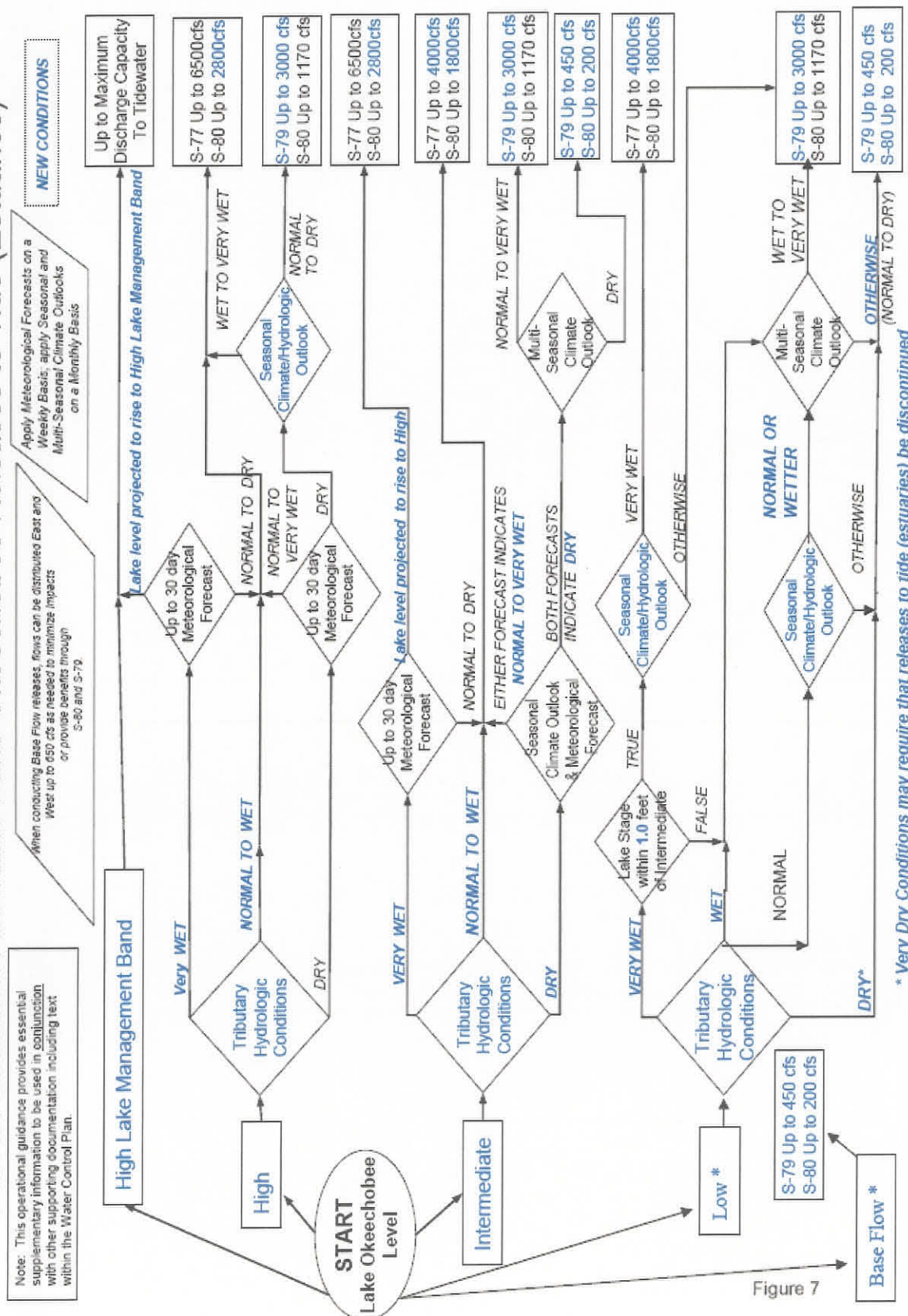


Table 2: Definition of Tributary conditions based on the Palmer Index and Net Inflow

Tributary Hydrologic Classification	Palmer Index Class Limits	2-wk mean L.O. Net Inflow Class Limits
Very Wet	3.0 or greater	Greater >= 6000 cfs
Wet	1.5 to 2.99	2500-5999 cfs
Near Normal	-1.49 to 1.49	500-2499 cfs
Dry	-1.5 to -2.99	-5000 – 500 cfs
Very Dry*	-3.0 or less	Less than -5000 cfs

The wettest of the two indicators describes the current tributary condition

*For modeling purposes, the dry and very dry classes can be combined into one class

The Net Inflow is represented by $NI = RF - ET + \text{Inflows}$,

where RF = rainfall over the lake, ET = lake evapotranspiration, and Inflows = all inflows to the Lake.

Using the basic mass balance equation, the Net Inflow can be calculated by $NI = DS + \text{Outflows}$, where DS = storage change, and Outflows = measured outflows

The Palmer Index is a meteorological index that responds to weather conditions that have been abnormally dry or abnormally wet. The index is calculated based on precipitation and temperature data, as well as the local available water content of the soil.

Discussion on Palmer Index: <http://www.drought.unl.edu/whatis/indices.htm#pdsi>

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/palmer_drought_wpdanote.shtml

Current Conditions:

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif

Table 2